MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

TES3211 – EXPERT SYSTEMS

(TC 01)

26 MAY 2017
9.00am – 11.00am
(2 hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 7 pages with 5 questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please print all your answers in the answer booklet provided.

QUESTION 1

(a) Discuss the basic assumption of Dempster-Shafer theory. State THREE features that differentiate between Dempster-Shafer theory and Probability theory.

[4 marks]

(b) Given the following information, use Dempster-Shafer theory to calculate the combined mass: m_3 ({B}), m_3 ({B,F}), m_3 ({Θ}).

You are given the following information:

$m_1(\{B,F\}) = 0.7$
$m_1(\Theta) = 0.3$
$m_2(\{B\}) = 0.9$
$m_2(\Theta) = 0.1$

[4 marks]

(c) Write all the possible subsets to a set {e, x, z} according to Dempster-Shafer theory.

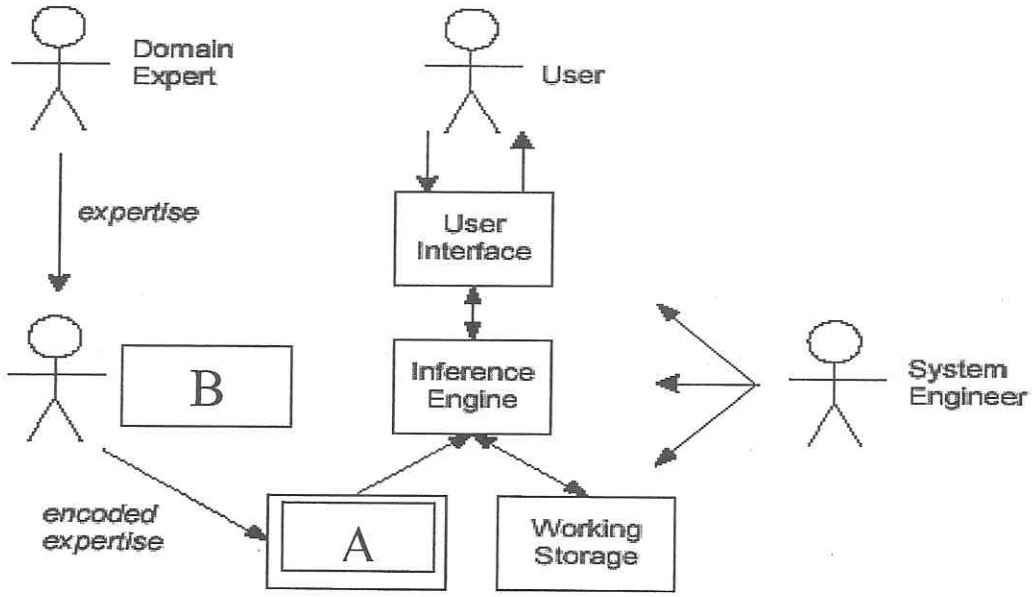
[2 marks]

Continued...

QUESTION 2

(a) Name and discuss the functionality of component A and B as labeled in the following diagram.

[2 marks]



(b) Study the following sentences in Knowledge Base (KB)

Clement lives in Putrojeye.	%1
People living in Putrojeye are suffering from high fever	%2
High fever indicates malaria fever.	%3

Translate the above sentences into *first-order logic* sentences.

[2 marks]

(c) Convert the *first-order logic* sentences as in Question 2(b) into Conjunctive Normal Form (CNF) and apply resolution refutation to prove that the Knowledge Base (KB) entails sentence

"*Clement is having malaria fever.*"

[6 marks]

Continued...

QUESTION 3

(a)

```
IF      your body temperature is high
OR      you have headache
THEN    you have malaria fever
                                              CF = 0.8

Assuming that

CF (you have headache)                  = 0.7
CF (your body temperature is high)      = 0.5
```

Based on the information as above, calculate CF(you have malaria fever).

[2 marks]

(b) Given the information:

```
IF    the thermometer reading is high
THEN  you need to see doctor
                                              CF_rule1=0.9

IF    your parents say you have fever
THEN  you need to see doctor
                                              CF_rule2=0.7

Assuming that

CF (the thermometer reading is high)    = 0.9
CF (your parents say you have fever)    = 0.6
```

Calculate $CF_{combined}(CF_{rule1}, CF_{rule2})$.

[6 marks]

(c) Differentiate between *shallow* reasoning and *deep* reasoning.

[2 marks]

Continued...

QUESTION 4

Generating tailored advertisements to mobile users is difficult. The challenge comes from the *how* and *when* to push advertisements to users, in order to minimize interruption. Advertisements can be categorized into food, cloth, book, computer accessories, and many more. There are a few variables and factors that can determine the type of advertisements to be pushed to users. Study the following information carefully.

Information 1: Variables of advertisement

The type of advertisement to push to users depends on (a) *the location of the user*, (b) *the current time of the user*, (c) *hobby of the user*, and (d) *user characteristics*.

A user characteristic can take one of these four states (a) *driver*, (b) *influencer*, and (c) *thinker*, and (d) *relater*. The user characteristic can be inferred from (a) *the way the user interacts with peers*, (b) *the preferred food of that user*.

Information 2: Rules

```
IF
     Location of user = shopping complex
     Current time of user = noon
     Hobby of user = camera
     User characteristic = thinker
THEN
     Advertisement = Computer accessories promotion

IF
     Location of user = on a street
     Current time of user = 5pm
     Hobby of user = cloth
     User characteristic = driver
THEN
     Advertisement = food promotion
```

(a) Create a Bayesian Network based on Information 1.

[3 marks]

(b) List all *Observable* (*evidential*) nodes and *Unobservable* nodes.

[3 marks]

Continued...

(c) Complete the following codes in CLIPS. You should refer to Information 2.

```
(deftemplate user_info
             (slot user_characteristic)
             (slot current_time)
             (slot Hobby)
             (slot location))

(deftemplate advertisement (slot _____))

(defrule computer_assessories
             (user_info (user_characteristic _____)

                        (current_time _____)

                        (location _____)

                        (hobby camera)
            =>
             (assert (advertisement (type
              computer_assesories))))
```

[4 marks]

Continued...

QUESTION 5

(a) Suppose that a doctor performs a test to determine if one of her patients is suffering from dengue fever. The test gives either a positive or negative result. Most of the time the test is quite accurate: only 1 positive result in 100 is incorrect and only 1 negative result in 1000 is incorrect. Given that the doctor has found that about 70% of patients who come to her for dengue fever tests are in fact suffering for dengue fever, use Bayes' Rule to calculate the probability a patient the doctor sees is suffering from dengue fever given that the dengue fever test gives a positive result.

[4 marks]

(b) Given the following rules and facts, draw two separate And-Or Graphs for the forward-chaining and backward-chaining inference techniques respectively, to show how E could be derived from the premises.

Rules	Facts
R1: IF A AND B THEN D	A, B
R2: IF B THEN C	
R3: IF C AND D THEN E	

[2 marks]

(c) Represent the following knowledge as a semantic net.

(i) "All tigers are mammals"
(ii) "Mimi is the name of a tiger"

[2 marks]

(d) Draw a frame system for a tiger with any three slots.

[2 marks]

End of Page.